

Division IV Design Considerations

Chapter IV-16 Bicyclists

Introduction

The Washington State Department of Transportation (WSDOT) encourages multimodal use of its transportation facilities. Bicycle facilities or improvements for bicycle transportation are included in the project development and highway programming processes where bicycle use is likely and can be accommodated safely.

This chapter is to serve as a guide for selecting and designing the most useful and cost-effective bicycle facility possible and for how to include the region's Bicycle Coordinator in the design process. These guidelines apply to normal situations encountered during project development. Unique design problems are resolved on a project-by-project basis using guidance from the region's Bicycle Coordinator.

State law (46.61.710 RCW) prohibits the operation of mopeds on facilities specifically designed for bicyclists, pedestrians, and equestrians. Mopeds are not considered in the design process for the purposes of this chapter.

In general, do not mix equestrian and bicycle traffic on a shared use path. Consider designing a bridle trail that is separate from the shared use path in common equestrian corridors.

Definitions

bicycle route A system of bikeways, designated by the jurisdiction having the authority, featuring appropriate directional and informational route markers. A series of bikeways may be combined to establish a continuous route and may consist of any or all types of bicycle facilities.

bike lane A portion of a highway or street identified by signs and/or pavement markings reserved for bicycle use.

bikeway Any trail, path, part of a highway or shoulder, or any other traveled way specifically signed and/or marked for bicycle travel.

Category A bicyclist Advanced or experienced riders who are generally using their bicycles as they would a motor vehicle. They want direct access to destinations with a minimum of delay and are comfortable riding with motor vehicle traffic. When touring, their vehicles are commonly heavily loaded with a tandem rider, children, or camping gear. They need sufficient operating space on the traveled way or shoulder to eliminate the need for them or passing vehicles to shift position.

Category B bicyclist Basic or less confident adult bicyclists who might be using their bicycles for transportation purposes. They prefer to avoid roads with fast and busy motor vehicle traffic unless there is ample roadway width. Basic bicyclists are comfortable riding on neighborhood streets and shared use paths; however, on busier streets, they prefer designated facilities such as bike lanes or wide shoulder lanes.

Category C bicyclist Children, riding alone or with their parents, who need access to key destinations in the community such as schools, friends, recreational facilities, and convenience stores. Residential streets with low motor vehicle speeds (linked with shared use paths and busier streets with well-defined pavement marking between bicycles and motor vehicles) can accommodate children without encouraging them to ride in the traveled lane of major arterials.

rural bicycle touring routes State highways or sections of state highways that are used or have a high potential for use by Category A bicyclists riding long distance on single or multiple day trips.

shared roadway A roadway that is open to both bicycle and motor vehicle travel. Shared roadways do not have dedicated facilities for bicycle travel.

signed shared roadway (designated as a bike route) A shared roadway that has been designated by signing as a preferred route for bicycle use. Appropriate bike route signs are installed to assure bicyclists that improvements such as widening shoulders have been made to improve safety.

shared use path A facility on exclusive right of way with minimal cross flow by motor vehicles. It is designed and built primarily for use by bicycles but is also used by pedestrians, joggers, skaters, wheelchair users (both non-motorized and motorized), and others.

Design Purpose and Need

Planning

Bikeway planning includes provisions and facilities for safe and efficient bicycle travel. An effective multimodal transportation program addresses the issue of upgrading highways to accommodate shared use by bicyclists and motorists.

Bicyclists of all skill levels will use well-designed facilities. Bicyclists will avoid a poorly designed facility.

To enhance bicycle travel, consider upgrading existing roads that are used regularly by Category A or B bicyclists. The upgrading includes improving the width and quality of the surface and maintaining the right-hand portion in a condition suitable for bicycle riding.

Consider bicycle facilities when designing all construction projects and normal safety and operational improvements. Shoulder widening projects along existing highways, might be an opportunity to encourage bicycle traffic and enhance bicycle safe. During the scoping process, widening of roadway and adding lanes may be in conflict with non-motorized plan and a separated path or “shared use” path may be better course of action. Correcting short areas of restricted width (such as bridges, cuts, or fills) to provide bikeways might not be cost effective. However, the presence of these short, restricted areas does not diminish the importance of widening the adjoining shoulder sections.

Bikeway planning is an integral part of the facility planning for other transportation modes and land use development. Use the location criteria that follow for long-term planning and project development as applicable.

Intersections and planned conflict areas with motor vehicle traffic are important planning level efforts. Merging, diverging and certain striping patterns are critical in helping position motor vehicles and bicyclists at intersections to minimize the number of conflicts. Signals are not the only type of intersection to consider however, single and multi-lane roundabouts have specific ways to handle non-motorized modes and stop controlled intersections may be the biggest challenge as most bicyclists prefer not to come to a complete stop unnecessarily if no conflicting traffic is in sight. Intersection design decisions will affect the way bicyclists adhere to the rules of the road.

Programming

The *State Highway System Plan* identifies two elements of bicycle project funding:

- Urban Bicycle Projects: Complete local bicycle networks by building short sections of appropriate bicycle facilities along or across state highways.
- Rural Bicycle Touring Routes: Shoulder improvements along sections of designated state routes.

Urban Bicycle Projects have been prioritized by the region's Planning Offices, the OSC Headquarters Bicycle Program, and the department's Bicycle Advisory Committee and are listed in the *State Highway System Plan*. Urban Bicycle Projects are selected in each region, prioritized, and will compete for funding.

Rural Bicycle Touring Routes (RBTR) programming priority areas are listed in the *State Highway System Plan*. Each region's Planning Office has a map with the priority areas marked. The purpose of the RBTR program is to add funding to a project in an RBTR shoulder deficiency area. Designers are to consult the region's Planning Office to determine if their project is within an RBTR shoulder deficiency area. If the project is within an RBTR shoulder deficiency area, the designer requests the region's Program Management to determine RBTR funding availability.

Consider spot bikeway improvements in other types of projects such as P1 paving and I2 safety improvement projects. Identify small improvements in the project definition phase. Consult the region's Bicycle Coordinator for recommendations and the limits of the work. Funding from other sources such as the Urban Bicycle and Rural Bicycle programs might be available.

Selection of the Type of Facility

In selecting an appropriate facility, ensure that the proposed facility will not encourage or require bicyclists or motorists to operate in a manner that is inconsistent with the Rules of the Road (RCW 46.61).

An important consideration is route continuity. Alternating bikeways from side to side along a route is generally unacceptable. Designing a route that

requires bicyclists to cross the roadway could result in inappropriate maneuvers and/or encourage Rules of the Road violations. In addition, wrong-way bicycle travel might occur beyond the ends of shared use paths because of the inconvenience of having to cross the street.

Many factors are involved in determining which type of facility will benefit the greatest number of bicyclists. Outlined below are the most common applications for each type.

Figure IV-2.1 Shared Use Path



- (a) **Shared Use Path.** The most common applications for shared use paths are along rivers and streams, ocean beachfronts, canals, utility rights of way, and abandoned railroad rights of way; within college campuses; and within and between parks. There might also be situations where such facilities can be provided as part of planned developments. Another common application of shared use paths is to close gaps in bicycle travel caused by construction of freeways, or the existence of natural barriers (rivers, mountains, and other large geographic features).

Generally, shared use paths are used to serve corridors not served by streets and highways or where wide rights of way exist permitting such facilities to be constructed away from the influence of parallel roadways. Shared use paths offer opportunities not provided by the road system. They can either provide a recreational opportunity or serve to minimize motor vehicle interference by providing direct high-speed bicycle commute routes. Depending on the frequency of roadway crossings a shared use path might encounter determines the extent to which it is used as a bicycle commute option. Stand alone projects to build grade separations of shared use paths to enhance its (shared use path) ability to provide dependable service is becoming more common. Transportation dollars are beginning to be funneled to “high value” investments that tie the community together with no conflict with motor vehicle traffic.

Figure IV-2.2 Bike Lane



- (b) **Bike Lane.** Bike lanes are established along streets in corridors where there is or, in the future, might be significant bicycle demand and are usually part of a MPO or RTPPO non-motorized plan within the geographical boundaries of the organization when reconstructing roads or preserving existing roads such as a paving project. For example, taking a four lane roadway and determining that it can be reduced to a three lane roadway and still provide a decent level of service to the corridor allows the installation of bike lanes. Numerous studies have been conducted that make this a very viable option in urban areas where four lane roadways have proven to be a safety liability and the reduction of the number of lanes increases safety and provides more multi-modal options for the corridor.

Bike lanes delineate the rights of way assigned to bicyclists and motorists and provide for movements that are more predictable by each. An important reason for establishing bike lanes is to better accommodate bicyclists through corridors where insufficient room exists for safe bicycling on existing streets. This can be accomplished by reducing the number of lanes or prohibiting parking in order to delineate bike lanes.

Where street improvements are not possible, improve the bicyclist's environment by providing shoulder sweeping programs and special signal facilities(**NEED EXAMPLES**).

When considering the selection of appropriate streets for bike lanes, refer to the location criteria discussed in 1020.04(4).

Do not designate sidewalks as bike lanes.

Figure IV-2.3 Shared Roadway



(c) **Shared Roadway.** Most bicycle travel in Washington occurs on highways and streets without bikeway designations. In most instances, entire street systems are fully adequate for safe and efficient bicycle travel and signing and pavement markings for bicycle use are unnecessary.

On state highways, the region's Traffic Office is responsible for determining the sections of the roadway where bicycle traffic might be inappropriate. The State Traffic Engineer, after consultation with the Bicycle Advisory Committee, prohibits bicycling on sections of state highways through the traffic regulation process.

Bicyclists traveling between cities, or on recreational trips, may use many rural highways. In most cases, rural highways are not designated as bike routes because of the limited use and the lack of continuity with other bike routes. However, the development and maintenance of paved shoulders, with or without a standard edge stripe, can significantly improve safety and convenience for bicyclists and motorists along such routes. Bicycle route designation usually calls for a minimum of a 6 foot shoulder however small sections of designated bicycle routes may not have that the minimum paved shoulder area.

Figure IV-2.4 Signed Shared Roadway(Designated Bike Route)



(d) **Signed Shared Roadway.** Designate signed shared roadways as bike routes by posting bike route signs. These routes provide continuity to other bicycle facilities and designate preferred routes through high bicycle-demand corridors. As with bike lanes, designating shared roadways as bike routes is an indication to bicyclists that there are particular advantages to using these bike routes as compared with alternative routes. This means that the responsible agencies have taken action to ensure that these routes are suitable as bike routes and are maintained in a manner consistent with the needs of bicyclists. Signing also alerts motor vehicle operators that bicycles are present.

Use the following criteria to aid in determining whether or not to designate and sign a bike route:

- ✓ The route offers a higher degree of service than alternative streets.
- ✓ It provides for through and direct travel in bicycle-demand corridors.
- ✓ It connects discontinuous segments of bikeways.
- ✓ Traffic control devices have been adjusted to accommodate bicyclists.
- ✓ Street parking is restricted for improved safety where lane width is critical.
- ✓ Surface hazards to bicyclists have been corrected.
- ✓ Maintenance of the route is to a higher standard than comparable streets, such as more frequent street sweeping and repair.

In general, do not designate sidewalks as bikeways for the following reasons:

- ✓ Sidewalks tend to be used in both directions, despite any signing to the contrary.

- ✓ At approaches to intersections, parked cars might impede sight distance of motorists and bicyclists. At driveways, property fences, shrubs, and other obstructions often impair sight distances.
- ✓ At intersections, motorists are not looking for bicyclists entering the crosswalk area, particularly when motorists are making a turn.
- ✓ Sidewalks are typically designed for pedestrian speeds, and might not be safe for higher-speed use. Conflicts between bicyclists and pedestrians are common, as are conflicts with fixed objects such as parking meters, utility poles, signposts, bus shelters, benches, trees, hydrants, and mailboxes. In addition, bicyclists riding on the curbside of sidewalks might accidentally drop off the sidewalk into the path of motor vehicle traffic.

Only consider a sidewalk as a bike route under special circumstances, such as on long, narrow bridges. Even then, the preferred solution is to widen the roadway to provide space for bicyclists. In residential areas, sidewalk riding is commonly done by Category B and C bicyclists who are not comfortable riding in the street. However, it is inappropriate to sign these facilities as bike routes.

Balancing Considerations

Factors to consider in determining the location of a bikeway are:

- (a) **Potential use.** Locate bikeways along corridors or a convenient road parallel to the corridor to maximize use. However, to attract commuting bicyclists, the roadway must offer through route conditions.
- (b) **Directness.** Locate facilities along a direct line and in such a way that they connect bicycle traffic generators for the convenience of the users. Bicyclists are interested in the same destinations as motorists.
- (c) **Access.** When locating a shared use path, provide adequate access points. The more access points, the more the facility will be used. Adequate access for emergency and service vehicles is also necessary.
- (d) **Shared use path widths.** The minimum width for a shared use path is 10 ft. A twelve-foot width is desirable if traffic is expected to increase in the near future. When the minimum path width is used, a 2 foot wide graded shoulder area on both sides of the path provides a place where bicyclists can stop out of traffic.
- (e) **Available roadway width.** For a bike lane or shared roadway (with or without signing), the overall roadway width must meet or exceed the highway minimum design criteria
- (f) **On-street motor vehicle parking.** Consider the density of on-street parking and the safety implications, such as opening car doors. If possible, select a route where on-street parking is light or where it can be prohibited.
- (g) **Delays.** Bicyclists have a strong desire to maintain momentum. If bicyclists are required to make frequent stops, they might avoid the route.

- (h) **Traffic volumes and speeds.** For an on-street bikeway, the volume and speed of auto traffic, along with the available width, are factors in determining the best location. Commuting bicyclists generally ride on arterial streets to minimize delay and because they are normally the only streets offering continuity for trips of several miles. The FHWA has developed a spreadsheet to evaluate roadways for bicycle compatibility. The Bicycle Compatibility Index (BCI) measures roadways based on traffic volume, speed, lane width, and other factors. A copy of the BCI and supporting information is found at <http://www.hsrc.unc.edu/research/pedbike/bci/index.html>
- (i) **Truck and bus traffic.** High-speed truck, bus, and recreational vehicle traffic can cause problems along a bikeway because of aerodynamic effects and vehicle widths. Evaluate the need to widen shoulders or change the location of the bicycle facility if it is on a roadway with this type of traffic.
- (j) **Existing physical barriers.** In some areas there are physical barriers to bicycle travel caused by topographical features such as rivers, limited access highways, or other impediments. In such cases, developing a facility that allows a bikeway to cross an existing barrier can provide access opportunities for bicyclists.
- (k) **Collision history.** Check the collision experiences along a prospective bicycle route to determine its relative safety compared to other candidate routes. This involves analysis of the collision types to determine which of them might be reduced. (See 1020.04(4)(p).) Consider both the impacts caused by adding bicycle traffic and the potential for introducing new accident problems. The region's Traffic Office is a good resource when considering collision factors.
- (l) **Grades.** Avoid steep grades on bikeways whenever possible. Refer to 1020.05(2)(k) for specific criteria.
- (m) **Pavement surface quality.** Establish an on-street bikeway only where pavement can be brought to a reasonable condition for safe bicycle travel. Dense graded asphalt concrete surfaces are preferable to open-graded asphalt concrete, Portland cement concrete, and seal-coated surfaces.
- (n) **Maintenance.** Ease of maintenance is an important consideration in locating and developing a bikeway. Consider the ease of access by maintenance vehicles. Bicyclists will often shun a poorly maintained bikeway in favor of a parallel roadway. Consult with area maintenance personnel during the planning stage.
- (o) **Environmental compatibility.** Consider scenic value, erosion and slope stability, and compatibility with the surrounding terrain when developing a bikeway. Provide landscaping to minimize adverse environmental effects.
- (p) **Use conflicts.** Different types of facilities produce different types of conflicts. On-street bikeways involve conflicts with motor vehicles. Shared use paths usually involve conflicts with other bicyclists, pedestrians, skaters, and runners on the path, and with motor vehicles at

street intersections. Conflicts between bicyclists and motorists can also occur at highway and driveway intersections, tight corners, and narrow facilities like bridges and tunnels.

- (q) **Security.** The potential for criminal acts against bicyclists and other users of bikeways exists anywhere, especially along remote stretches. There also is the possibility of theft or vandalism at parking locations. Consult local law enforcement agencies for guidance in making these areas safer. Also consider installation of telephones in high-risk areas.
- (r) **Cost/funding.** Location selection will normally involve a cost comparison analysis of alternatives. Funding availability will often eliminate some alternatives; however, it is more desirable to delay constructing a bicycle facility than to construct an inadequate facility.
- (s) **Structures.** Continuity can be provided to shared use path by using an overpass, underpass, tunnel, bridge, or by placing the facility on a highway bridge to cross obstacles. See 1020.03(2)(m) for design information.

Retrofitting bicycle facilities on existing bridges involves a large number of variables; compromises in desirable design criteria are often inevitable. The planner, with the assistance of the region's Bicycle Coordinator and the Bridge and Structures Office, on a case-by-case basis, will determine the desirable design criteria.

Consider the following alternatives when placing a shared use path on an existing highway bridge:

- ✓ On one side of a bridge. Do this where: the bridge facility connects at both ends to the path; there is sufficient width on that side of the bridge or additional width can be gained by remarking the pavement; and provisions have been made to physically separate the motor vehicle traffic from the bicycle traffic. Speeds of motor vehicles may preclude certain types of separation devices.
- ✓ Provide bicycle lanes, shoulders, or wide curb lanes over a bridge. This is advisable where: bike lanes and shoulders connect on either end of the structure, and when sufficient width exists or can be obtained by widening or remarking the pavement. Use this option only if the bike lane or wide outside lane can be accessed without increasing the potential for wrong-way riding or inappropriate crossing movements.
- (v) **Lighting.** Illumination of bicycle facilities might be necessary to achieve minimum levels of safety, security, and visibility.
- (w) **Support facilities.** Where bicycles are used extensively for utility trips or commuting, consider placing adequate bicycle parking and/or storage facilities at common destinations (such as park and ride lots, transit terminals, schools, and shopping centers). Contact the region's Bicycle Coordinator for additional information.

Governing Regulations and Directional Documents

Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), USDOT and Federal Highway Administration (FHWA), Washington, D.C., 2003.

Mopeds, Electric-Assisted Bicycles - General Requirements and Operation, Revised Code of Washington (RCW) 46.61.710.

Pavement Edge and Raised Pavement Markers Supplementing Other Markings, Washington Administrative Code (WAC) 468-95-035.

A Policy on Geometric Design of Highways and Streets, 4th ed. (Green Book), American Association of State Highway and Transportation Officials, (AASHTO), Washington, D.C., 2001.

Rules of the Road, RCW 46.61.

Standard Plans for Road, Bridge, and Municipal Construction, WSDOT, M 21-01.

Task Force on Geometric Design, *Guide for the Development of Bicycle Facilities*, AASHTO, Washington, D.C., 1999.

Washington State Modifications to the MUTCD, WSDOT, M 24-01.

Additional Resources

Washington State Highway Systems Plan: 2003-2022, WSDOT Transportation Planning Office, Olympia, WA, 2002.

<http://www.wsdot.wa.gov/ppsc/hsp/pdf/HSP-2003-2022.pdf>